

MECHATRONICS BOOK SERIES

CONTROL AND INTELLIGENT SYSTEMS

Momoh Jimoh E. Salami
Abiodun Musa Aibinu
Yasir Mohd Mustafah



IIUM Press

INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

MECHATRONICS BOOK SERIES

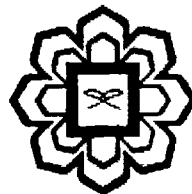
CONTROL AND INTELLIGENT SYSTEMS

EDITOR

Momoh Jimoh E. Salami

Abiodun Musa Aibinu

Yasir Mohd Mustafah



IIUM Press

Published by:
IIUM Press
International Islamic University Malaysia

First Edition, 2011
©IIUM Press, IIUM

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without any prior written permission of the publisher.

Perpustakaan Negara Malaysia

Cataloguing-in-Publication Data

Momoh Jimoh E. Salami, Abiodun Musa Aribinu, Yasir Mohd Mustafah: Mechatronics Book
Series: Control and Intelligent Systems

Bibliography p.
Includes Index
ISBN

ISBN: 978-967-418-176-5

Member of Majlis Penerbitan Ilmiah Malaysia – MAPIM
(Malaysian Scholarly Publishing Council)

Printed by :
IIUM PRINTING SDN.BHD.
No. 1, Jalan Industri Batu Caves 1/3
Taman Perindustrian Batu Caves
Batu Caves Centre Point
68100 Batu Caves
Selangor Darul Ehsan
Tel +603-6188 1542 / 44 / 45 Fax: +603-6188 1543
EMAIL: iiumprinting@yahoo.com

Table of Content

PREFACE.....	v
EDITOR.....	vi
SECTION 1: INTELLIGENT CONTROL SYSTEM	5
Chapter 1	6
Working Principle and Operating Mode of Atomic Force Microscopy	
Iskandar Al-Thani Mahmood	
Chapter 2	13
Design and Development of controller of Active Power Filter for Industrial Usage part 1	
M.M.Rashid ¹ , N.A.Ramin ² and Zahurul ²	
Chapter 3	21
Design and Development of controller of Active Power Filter for Industrial Usage part 2	
M.M.Rashid ¹ , N.A.Ramin ² and Zahurul ²	
Chapter 4	30
Design and Implementation of Instant Noodles Vending Machine	
M.M.Rashid	
Chapter 5	39
Development of Intelligent Belt Conveyor System (Part 1)	
M. M. Rashid, Faruok Alliays	
Chapter 6	45
Development of Intelligent Belt Conveyor System	
M.M.Rashid, Faruk, M J E Salami	
Chapter 7	50
Anti Skid Control System, A Tutorial	
M. J. E. Salami, A. M. Aibinu, A. F. Salami and Mohd Sofian Bin Basrah	
Chapter 8	54
Design and Prototyping of Inertia Wheel	
W. Astuti, A. R. Kasim, M. I. Solihin, A.M. Aibinu, Momoh Jimoh E.Salami and Wahyudi	
Chapter 9	62
Control of Automatic Drilling Machine by PLC	
Md Mozasser Rahman, Najiah Md Zain @Abdul Rahman and Mohd Syazwan Bin Jamil	
Chapter 10	74
Automatic Storage and Retrieval System	
Abdul Kadir Abdul Jabar Abdul Kadir, M. J. E. Salami and A. M. Aibinu	
Chapter 11	80
Control of Unmanned Underwater Vehicle	
Raisuddin Khan ^{1, a} , Faried Hasbullah ^{2, b} and Masum Billah ^{3, c}	
Chapter 12	85

Adaptive Sliding Mode Control for 3dof Helicopter

Mostafa A. Hamood^a, Rini Akmeliawati^b

Chapter 13	93
-------------------------	-----------

Backstepping Control of an Autonomous Quadrotor

Norafizah Abas¹, Rini Akmeliawati²

Chapter 14	103
-------------------------	------------

Piezoelectric Tube Scanner in Atomic Force Microscope

Iskandar Al-Thani Mahmood

SECTION II : INTELLIGENT CONTROL SYSTEM DESIGN	111
---	------------

Chapter 15	112
-------------------------	------------

A Review on Control of Two-Wheeled Wheelchair System

Salmiah Ahmad^{1, a}, M. O. Tokhi^{2, b}

Chapter 16	121
-------------------------	------------

A Smart Car Surveillance System using Programmable Logic Controller (PLC)

Siti Fauziah Tohaa and Mohammad Zafran Haja Mohideen

Chapter 17	128
-------------------------	------------

Design of Controller for Elevator Group Using Fuzzy Logic Part 1

M.M.Rashid, Azhar

Chapter 18	133
-------------------------	------------

Design of Controller for Elevator Group Using Fuzzy Logic Controller Part 2

M.M.Rashid, Azhar

Chapter 19	139
-------------------------	------------

Fuzzy Logic-based Intelligent Control of Flexible Link Manipulator

Ismaila B. Tijani and Rini Akmeliawati

Chapter 20	148
-------------------------	------------

EEG based robot control

A. Khorshidtalab and M. J. E. Salami

Chapter 21	158
-------------------------	------------

Visual-Based Intelligent Solar Tracking System

Rini Akmeliawati*, Samir A. Abdul Kareem, Riza Muhida

SECTION III: INTELLIGENT SYSTEM DESIGN	172
---	------------

Chapter 22	173
-------------------------	------------

Intelligent Air-conditioning System

Amir A. Shafie, Raisuddin Khan, H. Al-haieaid M. Ebrahim

Chapter 23	179
-------------------------	------------

An Intelligent Car Surveillance System: Design and Tools Selection

Siti Fauziah Toha³ and Mohammad Zafran Haja Mohideen

Chapter 24	185
-------------------------	------------

Automatic Pipe Bursting Monitoring System

M. J. E Salami, Syed Ahmed @ Hla Moe Win

Chapter 37	292
Kernel PCA – An Introduction	
Hamza Baali ^{1,a} , Momoh-Jimoh Eyiomika Salami ^{2,b} , Rini Akmeliawati ^{3,c}	
Chapter 38	297
System Modelling of a Twin rotor System: Time and Frequency Domain Analysis	
Siti Fauziah Toha ^{1,a} and M. O. Tokhi ^{2,b}	
Chapter 39	304
System Identification Technique for a Helicopter Using Genetic Algorithms	
Siti Fauziah Toha ^{1,a} and M. O. Tokhi ^{2,b}	
Chapter 40	311
Advanced Noise Removal Techniques for the Detection of EMG Signal	
Md. Rezwanul Ahsan ^{1,a} , Muhammad Ibn Ibrahimy ^{2,b} and Othman Omran Khalifa ^{3,c}	
Chapter 41	322
Active suspension system: Part 1 - Mathematical Modelling	
Aiman O. Bajaber ^a , Asan G. A. Muthalif ^b , Ayman S.I. Elzubair ^c	
Chapter 42	327
Active Suspension System: Part 2 - Controller Design and Simulation	
Ayman S.I. Elzubair ^a , Asan G. A. Muthalif ^b , Aiman O. Bajaber ^c	
Chapter 43	332
Book Shelving Robotics	
M. J. E. Salami ^{1,a} , Mohd Farid Md Alias ^{2,b} , Nurul Izzah Sidek ^{3,c} , Mohamed Mousa ^{4,d}	
Chapter 44	337
Model Structure and Random Input for System Identification Technique for Flexible Manipulating System	
Siti Fauziah Toha ^{1,a} and M. O. Tokhi ^{2,b}	
Chapter 45	344
Fault Tree Analysis, A case study of a simple Line Following Robot	
Abiodun Musa Aibinu, Haaris Ahmad Quadri, Mu Ham Mach A Mine, Almeahmadi Tarig Saeed S . And Hamide Rohimah	
Chapter 46	351
Review of Malaysian Traffic Summon and Payment system	
A. M. Aibinu, Sharifah Nadiyah bt Syed Mohammad, Wan Nur Faezah bin Wan Azmi	

Chapter 2

Design and Development of controller of Active Power Filter for Industrial Usage part 1

M.M.Rashid¹, N.A.Ramin² and Zahurul²

¹International Islamic Universities Malaysia

²University of Malaya, Malaysia

2.1 Introduction

Power electronics belongs to power, electronics and control. Power covers the area of production, conversion, transfer, distribution and utilization of electric energy at high efficiency, that is, at low loss. Power electronics processes and controls the power by supplying voltage and currents in a suitable form for user loads. The power input to the power processor, usually, supplied from the electric utility at a line frequency of 50 to 60 Hz, in single-phase or three-phase.

2.2 Harmonics

A periodic waveform can be described as a sum of sine waves with the frequency being multiples of the fundamental frequency. The non-fundamental components are called “harmonic distortion. Harmonic voltage distortion can be classified as voltage harmonic distortion and current harmonic distortion. Figure 1a shows the fundamental frequency wave (F1) with the 3rd harmonic frequency wave (3F1) and the 5th harmonic frequency wave (5F1), the resultant of the above three waveform, which is the major deviation from the fundamental wave (F1) is shown in Figure 2.1b.

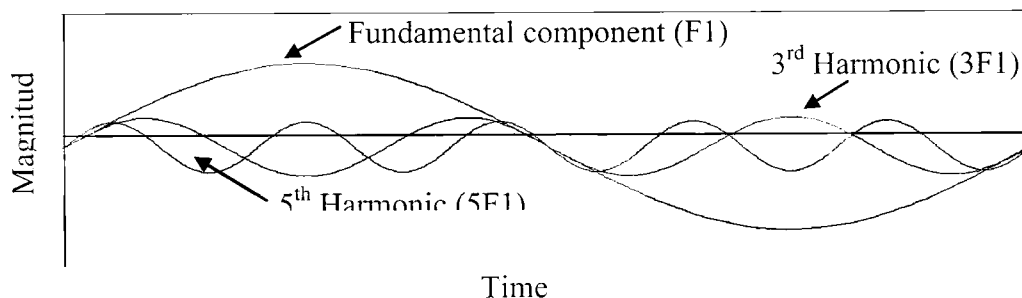


Figure 2.1a

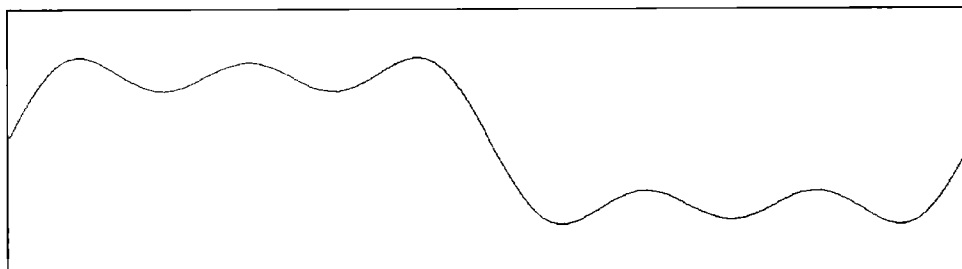


Figure 2.1b